Document Control No. 4400-17-ADKL

REVISION 0

FINAL PROJECT REPORT

RD/RA OVERSIGHT
PROJECT ASSISTANCE

HOWE VALLEY LANDFILL SITE
HOWE VALLEY, HARDIN COUNTY, KENTUCKY

Work Assignment No. 17-4XN8

OCTOBER 1994

REGION IV

U.S. EPA CONTRACT NO. 68-W9-0057

Roy F. Weston, Inc.
1880-H Beaver Ridge Circle
Norcross, Georgia 30071
(404) 263-5400

WESTON W.O. No. 04400-017-091-0062-00

U.S. EPA REGION IV

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OCTOBER 1994

Prepared by: _____ Date: 10/11/94
Ralph P. McKeen, P.E.
WESTON Work Assignment Manager

Technical Review
Performed by: _____ Date: 10-11-94
William R. Doyle
WESTON Senior Scientist

Approved by: _____ Date: 10/11/94
R. Randolph Ferguson, P.E.
WESTON Region IV Program Manager

Approved by: _____ Date: _____
Nestor Young
U.S. EPA Remedial Project Manager

Approved by: _____ Date: _____
Robert P. Stern
U.S. EPA Regional Project Officer

WESTON W.O. No. 04400-017-091-0062-00

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SECTION 1
INTRODUCTION

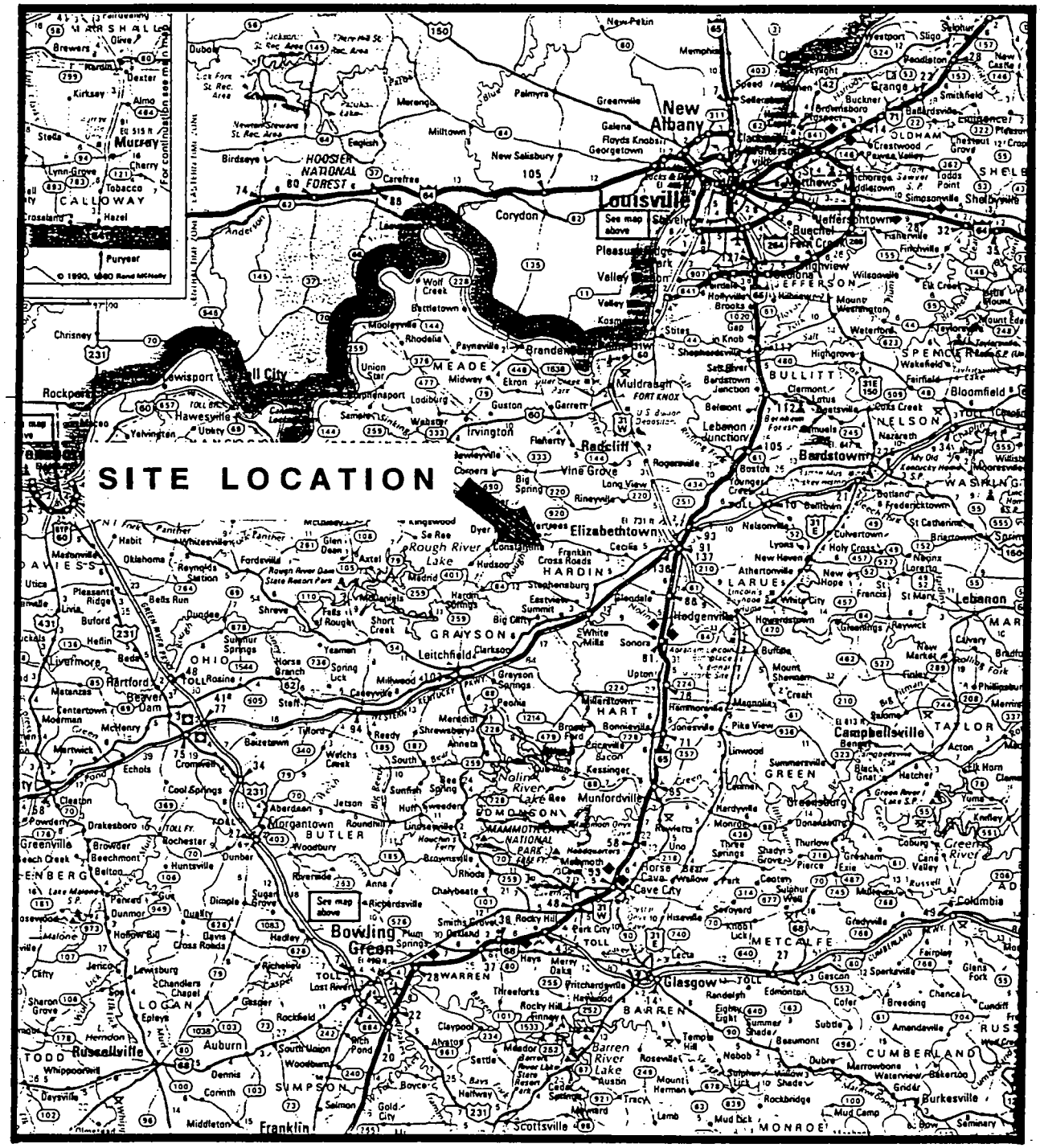
The Howe Valley Landfill site was placed on the National Priorities List (NPL) on July 22, 1987, due to the potential of contamination of the underlying karst groundwater system by CERCLA hazardous substances. The United Stated Environmental Protection Agency (EPA) determined that immediate removal actions were warranted at the site due to the number of buried drums and the fact that these drums contained hazardous wastes that were escaping to the environment. Because of existing conditions, the identified Responsible Parties (RPs) performed a drum removal action.

Following the removal action, the RP performed a Remedial Investigation and Feasibility Study (RI/FS) resulting in the issuance of the EPA Record of Decision (ROD) on September 28, 1990. On March 25, 1991, the EPA issued a Consent Decree to the RP. The Consent Decree pursued reimbursement for monies spent by EPA during previous response actions and required the RP to perform Remedial Design and Remedial Actions in accordance with the ROD.

This document presents the Work Plan for Remedial Design/Remedial Action (RD/RA) oversight performed by Roy F. Weston, Inc. (WESTON®) for the U.S. EPA Region IV under the Alternative Remedial Contract Strategy (ARCS) contract.

1.1 SITE LOCATION AND DESCRIPTION

The Howe Valley Landfill site is located approximately 45 miles southwest of Louisville, Kentucky, in a rural area of Hardin County (Figure 1-1). The site lies at the end of Tom Duvall



HOWE VALLEY LANDFILL
HOWE VALLEY, HARDIN COUNTY, KENTUCKY

FIGURE 1-1

Lane and is named for the unincorporated community of Howe Valley which is located 2 miles to the northeast. The nearest urban center is Elizabethtown with a population of 16,000, located approximately fifteen miles east of Howe Valley (Figure 1-2).

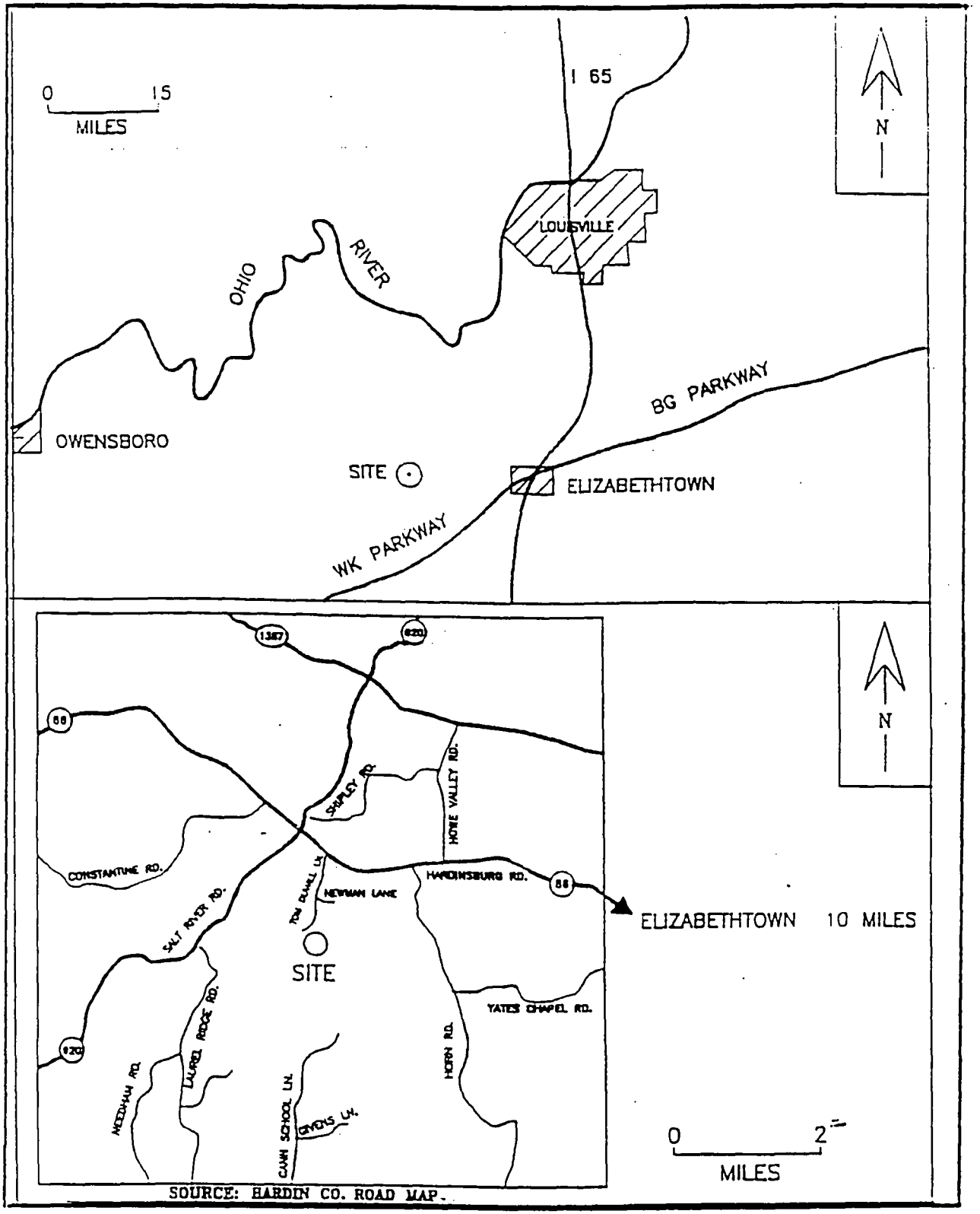
The site is approximately 11 acres in size and served as an industrial landfill from 1967 to 1976. Kentucky Industrial Services, Inc. operated the facility for the disposal of refuse and manufacturing by-products. Some of the wastes reportedly disposed of at the site included plating sludges, galvanizing wastes, silicone polymers, insulation, and insulation by-products. Many of the drums containing these materials and associated contaminated soils were remediated prior to the start of this RD/RA activity.

1.2 SITE HISTORY

1.2.1 Initial Investigation

In 1974, two years before closure of the landfill, an inspection by the Kentucky Division of Waste Management verified a citizens' complaint that acidic liquid wastes were being dumped into the landfill. This action violated the State-issued permit which did not allow the disposal of liquid wastes (the permit did not, however, differentiate between hazardous and non-hazardous wastes). The solid waste permit officially expired in 1974 and access to the site was limited, but not restricted, until the landfill closed in 1976.

The U.S Environmental Protection Agency's Field Investigation Team (FIT) performed a Preliminary Assessment and Site Investigation at the site in 1984. As part of their investigation, FIT conducted geophysical surveys which indicated that between 2,000 and 5,000 drums were



HOWE VALLEY LANDFILL
HOWE VALLEY, HARDIN COUNTY, KENTUCKY

FIGURE 1-2

buried in localized pockets over 2.5 acres of the site. Subsequently, the site received a Hazard Ranking Score (HRS) of 36.73 due to the potential of contamination to the underlying karst groundwater system. The site was proposed for the National Priorities List (NPL) on June 10, 1986, and became final on July 22, 1987.

In September 1987, the EPA performed soil sampling at the site which revealed cyanide and one organic contaminant. Sediment samples from an on-site pond revealed a trace amount of cyanide and three phthalate compounds.

1.2.2 Removal Actions

The EPA submitted notice letters to the potentially responsible parties (PRPs) on September 4, 1987, stating their possible liability for contamination at the landfill. Consequently, two of the nine PRPs identified agreed to perform a RI/FS and removal action. The EPA determined that an imminent threat to the environment existed at the site and emergency removal actions were warranted. The PRP contractor commenced with removal activities on June 7, 1988.

During the removal action, 9,150 full or partially filled 55-gallon drums, 1,621 empty drums, and 6,000 smaller drums were excavated and removed from the site. During the drum removal, approximately 10,000 gallons of contaminated runoff water were collected and treated on site. These removal actions were completed in May 1990.

1.2.3 Dye Tracing Investigations

Numerous dye tracing investigations were conducted to identify groundwater points of discharge resulting from water entering a sink hole located on the site. In 1988, sodium fluorescein dye was washed into the sinkhole while 28 discharge points were monitored. These points included springs, wells, and streams in the vicinity of the site. The points were "bugged" with activated charcoal packets for 34 days after the injection of the dye. The dye was detected in Boutwell Spring (headwater to Linders Creek), located 1.85 miles south of the site, and also downstream in Linders Creek. In 1990, a similar dye trace study was performed during high groundwater flow conditions. The bugging with charcoal packets continued for approximately 30 days, but dye was detected in Boutwell Spring only.

In a follow-up study, the United States Geological Survey (USGS) and RP contractors conducted additional dye trace studies north of the site. The results of these dye trace studies indicated that a groundwater divide is present just north of the site. The researchers found that dye was detected in Boutwell Spring as before, but none reached Pirtle Spring located north of the site. This finding is significant in that Pirtle Spring is the public drinking water supply for the Howe Valley area.

1.2.4 RI/FS

The RP continued with the RI and FS following the removal actions under an Administrative Order issued by the EPA. The RI/FS reports were completed and sent out for public review in July 1990. During the RI and FS, the RP contractor performed an on-site pilot study to determine the effectiveness of aeration for removing volatile organics. Approximately 6,000

cubic yards of soil were excavated and placed onto designated treating areas. The soil was then rototilled to promote aeration. Subsequent sampling of the treated soil revealed volatile organic concentrations above the EPA's soil action levels. These elevated concentrations were discounted; however, by the fact that the headspace analysis was not performed according to the EPA's Environmental Services Division guidelines. Therefore, soil aeration at the site remained as a potential remedy to remove volatile organic contamination.

The RI/FS indicated that the primary threat to human exposure at the site is direct contact with soils contaminated with both organic and inorganic constituents, the primary inorganic contaminants being chromium, copper, and zinc, and contamination is isolated to two specific areas. The selected remedy described in the ROD was to excavate and remove approximately 100 cubic yards of this soil for off-site disposal. The organic contamination was more widespread and located in the outlying areas. The primary organic contaminants were 1,1,1-trichloroethane, tetrachloroethane, and 1,2-dichloroethene. Approximately 7,500 cubic yards of soil were initially identified to be contaminated with organics above health-based levels. The cleanup levels were assigned to both reduce the health risk associated with soil ingestion to $1x10^{-6}$ as well as protecting groundwater. The following compounds were identified along with the associated Soil Action Level:

Compound	Soil Action Level (mg/kg)
Chromium	400
Copper	2,300
Zinc	16,000
Cyanide	1,600

1,1,1-Trichloroethane	117.30
1,2-Dichloroethene	7.72
Tetrachloroethane	7.50

1.3 DESCRIPTION OF THE REMEDIAL ACTIONS

Initially, a Bench-Scale Treatability Study was performed by the Dragun Corporation of Farmington Hills, Michigan, to insure that aeration would reduce the organic concentrations to less than the SALs. The study concluded that aeration was feasible.

Remedial actions consisted of soil excavation followed by on-site treatment and off-site disposal. On-site treatment of organic contamination was performed by aeration of the soil to volatilize the contaminants. Initially, the site was graded with diversion ditches and sediment ponds to control erosion and prevent surface water from flowing through the aeration areas. Aeration pads were prepared to enable contaminated soil to be placed uniformly in six inch lifts allowing the roto-tilling equipment to effectively work the soil, thus maximizing aeration. Throughout the remedial action, additional contaminated soil beneath bedrock was discovered. This soil was stockpiled and treated via aeration.

Inorganic soils identified with elevated levels of chromium were excavated and stockpiled on layers of plastic and sand. Following characterization, this soil was transported off-site for disposal.

During excavation of soils for aeration, additional buried drums containing organic wastes were discovered which required special handling. The drums were placed in overpack drums and sent off-site for disposal.

During the soil remediation efforts, surface water ponded in organic contaminated areas which required treatment. A treatment system consisting of air stripping and carbon adsorption was constructed to treat contaminated water.

Upon removal of all contaminated materials, the excavation area was reclaimed with clean aerated soils and excavated rock. The rock was placed around the perimeter of the site to restrict access.

SECTION 2
CHRONOLOGY OF EVENTS

The following paragraphs summarize major events in the completion of this project. Detailed accounts of activities observed by WESTON can be found in Appendix A - Field Oversight Reports. See also Appendix B of this report for photographic documentation of activities which were observed during WESTON's oversight visits.

25 November 1991

WESTON's Chris Szluha mobilized to the site for field oversight activities. WESTON collected split samples with the PRP contractor, Shield Environmental Associates, Inc. (formerly Hatcher-Sayre, Inc.). The initial task was to obtain water samples from the surrounding springs. Samples were collected from the Goodman Spring (G1) while guard dogs prevented access to the Boutwell Spring for sampling.

26 November 1991

WESTON collected a split sample with Shield Environmental at the Boutwell Spring. The sample was labelled BW. As part of the inorganic soil contamination, soil samples were collected from the two areas to further define the extent of contamination. These areas were excavated and sent off-site for disposal. WESTON collected a split soil sample at location 1.5D/C. WESTON submitted the split samples to the Environmental Services Division Lab in Athens, Georgia for analysis.

31 August 1992

WESTON's Chris Szluha mobilized to the site for documentation of the inorganic soil removal operations. The two areas designated as Area 7D and Area 1.5D were excavated and placed on a staging pad consisting of five layers of 6 mil thickness visqueen overlain by 12 inches of sand.

1 September 1992

Shield Environmental continued to prepare the staging area with sand and visqueen and commenced excavation in Area 7D.

2 September 1992

Excavation of Area 7 continued throughout this day. A trackhoe excavator removed and loaded the soil into a dump truck which transported the material to the staging area.

3 September 1992

The excavation of inorganic contaminated soils from both areas 7D and 1.5D was completed this date. WESTON collected a split sample from the bottom of excavation 7D for analysis by the EPA Environmental Services Division Lab in Athens, Georgia. Throughout the excavation process, Shield Environmental took composite samples from each sidewall and the bottom of the excavations for confirmation analysis.

14 September 1992

Shield Environmental proceeded with the pilot treatability study and during the process of excavating from the Trench #1 in the central area, additional free organic liquids were discovered. Excavation in this area ceased and samples of the material were obtained. In addition, buried drums were also uncovered while dressing up the drainage ditches around the excavation area. Aeration of the excavated materials for the pilot treatability study continued while a modification to the work plan was prepared to address the buried drums and additional free liquids.

22 September 1992

RPM Nestor Young and WESTON's Ralph McKeen travelled to Howe Valley to meet with the PRP to discuss the recent events. Dow's James Mersereau-Kempf and Shield Environmental's Jim Knauss described their proposed plan to address the buried drums and free organic liquids. Geophysical surveys were conducted over the entire site to identify any additional buried drums areas and Dow agreed to submit a work plan modification addressing the buried drums excavation and final disposition. Meanwhile, excavation of organic contaminated soils will be continued until analytical results of the free liquid are received.

26 October 1992

EPA approved the PRP's October 14, 1992 Work Plan for the Investigation and Handling of Drums contingent upon three minor modifications.

4 November 1992

Buried drum removal activities commenced this date. Due to the potentially hazardous nature of the buried drum removal activities, Level B personal protective equipment was required. EPA's Region IV Emergency Response Section and WESTON's Technical Assistance Team (TAT) performed oversight of these activities due to their experience with Level B activities. Two areas were identified with the EM-31 geophysical instrument that potentially contained buried drums. Excavation commenced this date in Area 1 and a total of seventy-seven 55-gallon drums were removed. See TAT Report of the drum removal activities in Appendix A.

5 November 1992

Drum removal activities continued in Area 2 this date. A total of ninety-three 55-gallon drums were removed from this area along with several 5-gallon buckets, which were placed into overpack drums. A total of 170 drums were excavated, removed and staged on site until final disposal arrangements were made. Once the drums and site were stabilized, the PRP contractor, Shield Environmental, Inc., demobilized for the winter months with EPA approval.

January 1993

Ms. Felicia Barnett was assigned as the EPA Remedial Project Manager for the project. The initial restart of work for the site consisted of arranging for disposal of staged drums and contaminated soils. In addition, a substantial amount of water from precipitation and runon accumulated in the open excavation areas where free organic liquids were discovered. This

water required removal prior to continuation of the organic liquid investigation so an on-site water treatment system was planned as the method for removal and treatment.

4 February 1993

WESTON mobilized to the site to monitor the start-up of the water treatment system and also collect split samples for analysis. Since the water treatment system was not completely operational, a water sample was collected from Boutwell Spring this date.

5 February 1993

Shield Environmental, Inc., completed the setup of the water treatment system and commenced treating water which accumulated in the central excavation area. The treatment system consisted of a filter followed by a granular activated carbon (GAC) unit. Water was treated at a rate of 40 gallons per minute. After passing through the GAC unit, treated water was pumped to a 2500-gallon poly tank and finally to a holding pond. The holding pond was designed to promote evaporation and infiltration. Sampling ports were installed in the line leading the holding pond. WESTON collected a split sample of the effluent for analysis at the EPA laboratory in Athens, Georgia.

April 1993

The high concentration of organics in the liquid caused the GAC units to be spent quickly; therefore, a low profile air stripper was installed ahead of the GAC unit to remove organics and increase the life of the carbon.

While attempting to perform a dye-trace investigation by injecting dye into the swallet in the central excavation area, additional free organic liquid was discovered. The liquid appeared to be originating from between bedrock layers. The EPA approved abandonment of the dye-trace study so that the source of the free organic liquids could be located. While searching for the source, it was discovered that an upper layer of bedrock contained solution features on the underside where organic liquids had migrated. This upper layer was then pulled back to expose the contamination for removal.

29 April 1993

The PRP contractor, Shield Environmental, Inc., continued to pull up the upper layer of limestone bedrock and exposing the organic liquids.

30 April 1993

The organic liquid investigation continued. Shield Environmental obtained a sample of the free liquid for analysis to compare with the previous analytical results of the contaminants of concern at the site. Additional earth moving equipment was required to move the large section of limestone bedrock encountered during the investigation.

June 1993

The PRP contractor resumed treating the organic contaminated soils via aeration according to the Final Organic Design Plan. The inorganic spoil pile was removed and transported off-site for final disposal.

12 July 1993

Remedial actions continued with soil aeration. WESTON mobilized to the site to collect split samples of confirmation samples of the aerated soil piles.

June 1994

The PRP completed aeration activities which ended the active portion of the remedial actions. Verification sampling was conducted in accordance with the Final Remediation Verification Work Plan. WESTON's oversight role from July 1993 through July 1994 included review of PRP documents. The RPM conducted all prefinal and final inspections of the site.

SECTION 3

AGENCIES, ORGANIZATIONS, AND INDIVIDUALS INVOLVED

Names & Addresses	Contact	Involvement
U.S. EPA Region IV KY/TN Remedial Section 345 Courtland St., N.E. Atlanta, Georgia 30365 (404) 347-7791	Nestor Young Felicia Barnett	Remedial Project Manager. Responsible for oversight of the entire project to ensure that RD/RA activities were completed in accordance with the Consent Decree.
Roy F. Weston, Inc. 1880-H Beaver Ridge Circle Norcross, Georgia 30071 (404) 263-5400	Ralph P. McKeen Chris Szluha	EPA oversight contractor responsible for review of technical documents and documentation of field activities.
Roy F. Weston, Inc. 10121 Production Court Louisville, Kentucky 40299 (502) 491-0872	Leanna Smith	Performed oversight and air monitoring during the removal actions of the buried drums.
Dow Corning Corporation 3901 S. Saginaw Midland, Michigan 48686	James Mersereau-Kempf	Environmental Geologist coordinating the activities as the PRP representative.
Shield Environmental Associates, Inc. (formerly Hatcher-Sayre, Inc.) 3150 Custer Drive, Suite 301 Lexington, Kentucky 40517	James Knauss	Project Manager. PRP's prime contractor for the remedial design and remedial action activities.
Cambrian Technology, Inc. Louisville, Kentucky (502) 968-2248	Tim Young	Site Manager. Remedial action subcontractor - managed all day-to-day site activities.
Ewers Water Consultants, Inc. 160 Redwood Drive Richmond, Kentucky 40475 (606) 623-8464	Dr. Ralph Ewers	Subcontractor to perform the dye-tracer studies as part of the remedial action.
The Dragun Corporation 30445 NW Hwy, Suite 260 Farmington Hills, Michigan 48334 (313) 932-0228	Dr. James Dragun	Subcontractor to perform the Bench-Scale Treatability Study for determining the feasibility of soil aeration.

SECTION 4
EFFECTIVENESS OF THE REMEDIAL ACTION

Both the organic and inorganic contaminated soils identified at the site were either treated to below the soil action levels or sent off-site for disposal.

The discovery of buried drums and free organic liquids required special handling and remediation efforts. WESTON observed both remediation of the buried drums and free liquids. These unexpected activities created major delays in the original schedule by adding to the volume of material requiring treatment. These additional volumes were handled properly, and although the project was completed behind schedule, the quality of work was not compromised and the soil remedial action was effectively completed. No remediation of groundwater was performed; however, additional dye-trace studies were conducted which confirmed Boutwell Spring as the receiving point for any contamination from the site. Therefore, the overall effectiveness of these actions will be determined in the months and years to come when Boutwell Spring sampling is conducted in accordance with the Site Maintenance and Monitoring Work Plan. Review of this data will be essential during EPA's five-year review of this remedial action as presented in the Scope of Work in the Consent Decree.

As reported by the remediation contractor, Shield Environmental Associates, Inc., approximately 18,480 cubic yards of organic contaminated soil were treated on-site and 1,465.5 tons of inorganic contaminated soil were transported off-site to Chemical Waste Management's facility in Emelle, Alabama. Additionally, 151 drums of silicone wastes were transported to Petro-Chem Processing, Inc. for incineration, and 17 loads of non-hazardous debris was transported to the Outer Loop Sanitary Landfill in Louisville, Kentucky.

APPENDIX A

FIELD OVERSIGHT SUMMARY REPORTS

MEMORANDUM

TO: Michael Norman
Section Chief, Region IV

FROM: Leanna Smith
TAT, Region IV

THRU: William R. Doyle
TATL, Region IV

SUBJECT: Howe Valley Landfill Drum Removal Monitoring
Howe Valley, Hardin County, Kentucky
TDD# 04-9210-0132-4138
TAT# 04-F-

DATE: 25 November 1992

SITUATION

This report has been prepared in accordance with Technical Direction Document (TDD) #04-9207-0027, issued to the Roy F. Weston, Inc., Technical Assistance Team (TAT) Louisville Satellite Office, by Region IV of the United States Environmental Protection Agency (USEPA). TAT was tasked by USEPA Section Chief Mike Norman to monitor the removal of buried drums at the Howe Valley Landfill Site in Hardin County, Kentucky. The site is listed on the NPL and has been the subject of remedial activities since 1988. Dow Corning Corporation (DOW) was identified as the responsible party and has cooperated with the USEPA in the clean-up and remediation of the site. Hatcher-Sayre, Inc. (HS) was contracted by DOW to develop and implement a work plan for remediation of the site. Previous activities at the site have included the excavation and removal of over 17,000 drums, excavation and staging of contaminated soils and aeration of these soils to remove organic contamination. The types of waste reportedly disposed at the site include manufacturing sludges, plating sludges, galvanizing wastes, silicone polymers and
insulation.

Additional buried drums were recently discovered during excavation of a drainage ditch through the site. Remedial Project Manager (RPM) Nester Young requested the assistance of the TAT due to the knowledge of drum removal operations within the TAT program.

SUMMARY

TAT member Smith arrived at the Howe Valley Site at 0930 on 04 November 1992. The weather was cloudy and cold with a temperature of 40 degrees Fahrenheit and the site was muddy due to recent rain in the area. Tim Young, a consultant for HS, explained the history of the site to Smith and identified two areas where drums had been

unearthed. The original area was discovered while digging a drainage ditch and the other area was located through a subsequent geophysical survey of the site conducted by HS.

Excavation began in anomaly area #1 at 1045 (Figure 1 - Site Diagram with Anomaly Locations). HS subcontracted the heavy equipment work to Taurus, Inc. Four Taurus heavy equipment operators and one technician were in Level B. Taurus used a trackhoe with a bucket (trackhoe), a trackhoe with a drum grappler attachment (grappler), a small bulldozer and a backhoe. The technician was used for opening and closing the overpack drums. Hatcher-Sayre had two technicians in Level C, one to assist in the drum staging area and the other to monitor with an HNu. A third technician was in Level B in case a backup person was needed.

Several loads of rock were delivered which the backhoe placed on the site access road between the excavation area and the drum staging area to prevent the backhoe from slipping in the mud.

The trackhoe was used to remove the overburden soil and expose the drums. Once a drum was uncovered, the grappler would remove it from the excavation and the operator would assess the condition of the drum to determine whether it was necessary to place it in an overpack (recovery) drum. All drums that were leaking were placed into overpacks. Young stated that the clear liquid leaking from the drums appeared to be the liquid silicone that was discovered in the original group of drums removed in 1988. The empty overpacks were situated immediately adjacent to the excavation to minimize the contamination of surrounding soils by the leaking contents of the drums. The intact and/or empty drums were taken directly to the drum staging area. All soils that were removed from around the drums were staged adjacent to the excavation.

The drums were situated upright and side by side within the excavation. The HS technician continually monitored the excavation and drums with the HNu and only obtained elevated readings from within the drums. All of the drums that were encountered were blue and white 55-gallon drums with DOW CORNING printed on the side.

By 1200, 34 drums had been removed from the excavation. Nineteen of the 34 drums had been placed in overpack drums. The drums were transported to the drum staging area using the backhoe. The crews stopped for lunch while additional overpacks were en route to the site from the local Dow Corning facility in Elizabethtown. Jim Mersereau-Kempf, a representative from DOW, was on-site throughout drum removal activities.

Activities resumed at 1410 with the same crews. An additional 43 drums were removed from the excavation during the afternoon, making a total of 77 55-gallon drums, three 5-gallon and two 1-gallon containers removed from anomaly area #1. Thirty drums and 40 overpacked drums were transported to the drum staging area. Several of the drums were left in the excavation since additional overpacks would not be available until the following morning. The

excavation and remaining drums were then covered with visqueen. Excavation and removal activities were completed by 1615.

Smith updated RPM Young of site activities and made plans to return to the site the following day when excavation would begin at anomaly area #2.

Smith arrived at the site at 0830 on 05 November. The day was rainy and cold with occasional snow flurries. Upon arrival by the TAT, the Taurus crew was using the trackhoe and bulldozer to widen the drum staging area to accommodate more drums. The staging area was lined with two layers of visqueen and the drums were also covered with visqueen.

DOW delivered additional empty overpack drums at 1000 which the backhoe transported to anomaly area #2 (Figure 1). The trackhoe uncovered three upright DOW CORNING drums during initial digging in area #2. The Taurus and HS crews began removal activities in Level B at 1019. A HS technician continually monitored with the HNu but, again, only obtained elevated readings within the drums.

The crew stopped for lunch at 1200 after removing 45 drums from the excavation. Approximately ten 5-gallon containers were also removed. The majority of the drums were the blue and white DOW CORNING drums, but several were plain white, smooth drums.

Excavation continued at 1330 and all drums were removed from anomaly area #2 by 1430. Forty eight drums were removed during the afternoon, resulting in a total of 93 55-gallon drums, one 35-gallon and 12 5-gallon containers. Of the 93 drums, 28 were overpacked. Approximately ten of the drums appeared to be fiber drums wrapped or lined in plastic.

After activities were completed, a HS technician checked the walls of the excavation with a metal detector. The trackhoe inspected several spots and removed several drum lids, rings and pieces of small containers.

While the grappler and backhoe transported the drums and overpacks to the staging area, the trackhoe excavated test trenches in several other possible burial areas that were identified by the geophysical survey. The trackhoe checked a small area 20 - 30 feet northwest of anomaly area #2 and discovered a buried trash barrel. At another anomaly area on the eastern edge of the site, bedrock was uncovered at 3 feet below the surface. There was some debris present, but the bedrock precluded the possibility of buried drums. The trackhoe also checked an area on the southwestern edge of the sinkhole and an area located directly north of the northern drainage pond. These areas contained only drum lids, rings and debris. The final area inspected by the trackhoe was located on the western edge of the site, adjacent to the support zone. Several drum lids, rings and two 5-gallon containers were removed from the area. An area of visibly stained soil was uncovered and Young stated that this was characteristic of the soil contamination

found at the site.

At 1730, work was suspended due to darkness. The drums from anomaly area #2 that had not been moved to the staging area were covered with visqueen. The area with the stained soil was also covered until the soil could be moved to a stockpile.

CONCLUSION

Young assured Smith that the soils in anomaly area #1 and #2 would be removed and placed on visqueen next to their respective excavations. Plans are to finish moving drums to the staging area, remove and stockpile all contaminated soils and stabilize the site. Once the site is stabilized, HS may cease activities through the winter months pending EPA approval.

At the request of RPM Young, Smith had previously sent the site photos and negatives to him for an upcoming public meeting. This report will be forwarded to RPM Young after review by Section Chief Norman.

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MANAGERS. DESIGNERS/CONSULTANTS
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September 16, 1992

Mr. Nestor Young
Remedial Project Manager
U.S. Environmental Protection Agency, Region IV
345 Courtland Street, N.E.
Atlanta, Georgia 30365

WESTON W.O. No. 04400-017-091

RE: Field Oversight Summary Report No. 1
Howe Valley Landfill Site, Howe Valley, Hardin County, Kentucky
Contract No. 68-W9-0057
Work Assignment No. 17-4XN8
Document Control No. 4400-17-ACEW

Dear Mr. Young:

Enclosed is WESTON's Field Oversight Report for the week of August 31, 1992, through September 4, 1992, at the Howe Valley Landfill site. This report includes a summary of activities performed by the PRP contractor, Hatcher-Sayre, Inc., and WESTON's oversight activities in accordance with Task 5 of the oversight work plan.

The activities performed this week included the excavation and stockpiling of the inorganic contaminated soils and associated confirmatory sampling. Photographic documentation of these activities is also included with this report.

Please call Randy Ferguson or me at (404) 448-0644 if you have any questions.

Sincerely,

ROY F. WESTON, INC.

Ralph P. McKeen
Work Assignment Manager

RPM/cmf
Enclosure
cc: Annie Godfrey, EPA, Region IV
L. Lewis, EPA, Region IV
R.R. Ferguson, WESTON

B:H1\HOWEVALL\LTRRM001.CMF

ATTACHMENT

Contract No. 68-W9-0057
Work Assignment No. 17-4XN8
Document Control No. 4400-17-ACEW

Situation

This report provides information regarding field activities at Howe Valley Landfill Site, from August 31, to September 4, 1992. Present on-site were the following:

Name	Company	Role
Tim Young	Tim Young, Inc.	Private Consultant
Paul Weaver	Hatcher-Sayre, Inc.	Site Manager
Raymond Savage	Taurus, Inc.	Excavation Contractor
Bruce Wayne	Taurus, Inc.	Equipment Operator
Christopher Szluha	Roy F. Weston, Inc.	EPA Oversight

This phase of field activities was to last four days beginning on August 31, and ending September 3, 1992. Due to trackhoe mechanical difficulties excavation did not begin until the late afternoon of September 2, 1992.

Activity Summary

Field activities performed by Hatcher-Sayre and Taurus, Inc., during the period that the WESTON representative was on-site consisted of the excavation and sampling of two areas containing known inorganic contaminants. Excavation and sampling locations included Area 7D and a relatively smaller location, Area 1.5D. Soil was removed from each location using a large excavator and staged in a stockpile that was lined with plastic and a layer of sand.

Upon completion of excavation a Hatcher-Sayre obtained confirmatory samples of the bottom and side walls of the excavated areas. In areas where excavation had gone to

bedrock, no soil samples were taken. The purpose of the sampling was to verify that excavation would meet the specified soil action levels for chromium, copper, zinc, and cyanide.

For QA/QC purposes the WESTON representative split a composite soil sample from Location 7D. This split sample was submitted to the EPA Environmental Services Division, Region IV Laboratory in Athens, Georgia (see Exhibit 1: Split Samples with corresponding analysis).

Additional QA/QC procedures included the incorporation of a sediment blank into the population of samples submitted to Hatcher-Sayre's laboratory (see Exhibit 2: Spike/Blank Samples with corresponding name).

Work Plan Deviations

This section describes work plan deviations observed during this phase of field activities.

- Deviations from the work plan involved the use of five layers of 6 mil visqueen instead of the originally planned one layer of 30 mil HDPE liner. This change was made in the interest of time as well as cost. Proper notification of this deviation was made and no resolutions were necessary.

Future Planned Activities

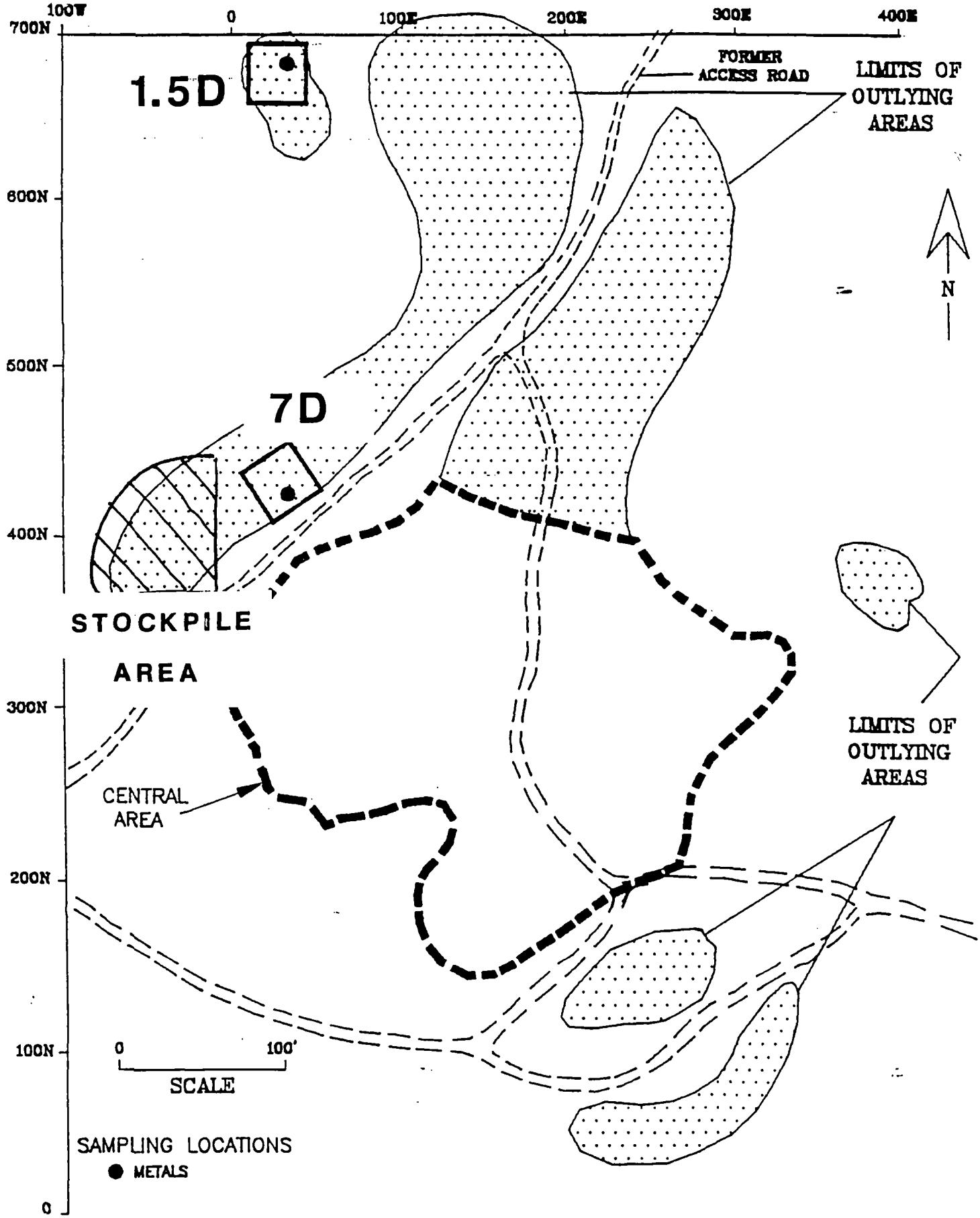
Hatcher-Sayre plans to complete the inorganic removal phase on September 14, 1992, pending favorable results of the confirmation samples. WESTON will provide oversight of the trucking off-site as well as monitor the progress of the organic remedial action pilot study.

EXHIBIT 1

SPLIT SAMPLES		
Location	Hatcher-Sayre Number	Analysis
7D Bottom	1264	C4, Cu, Zn, CN

EXHIBIT 2

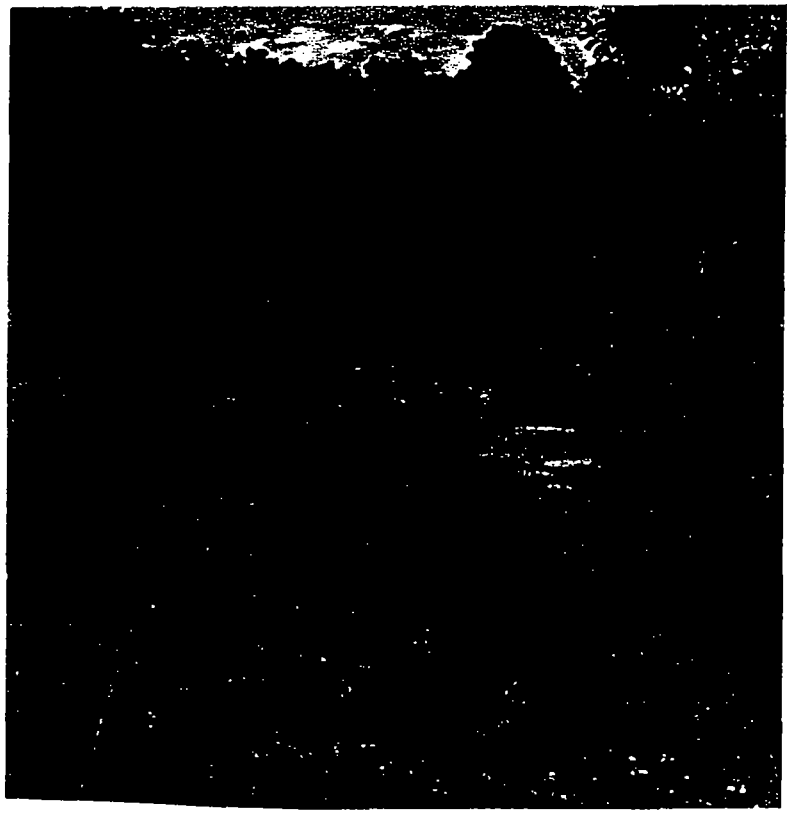
SPIKE/BLANK SAMPLES		
Sample Type	Corresponding Hatcher-Sayre Name	Hatcher-Sayre Number
Inorganic Sediment Blank	7 Bottom	1265



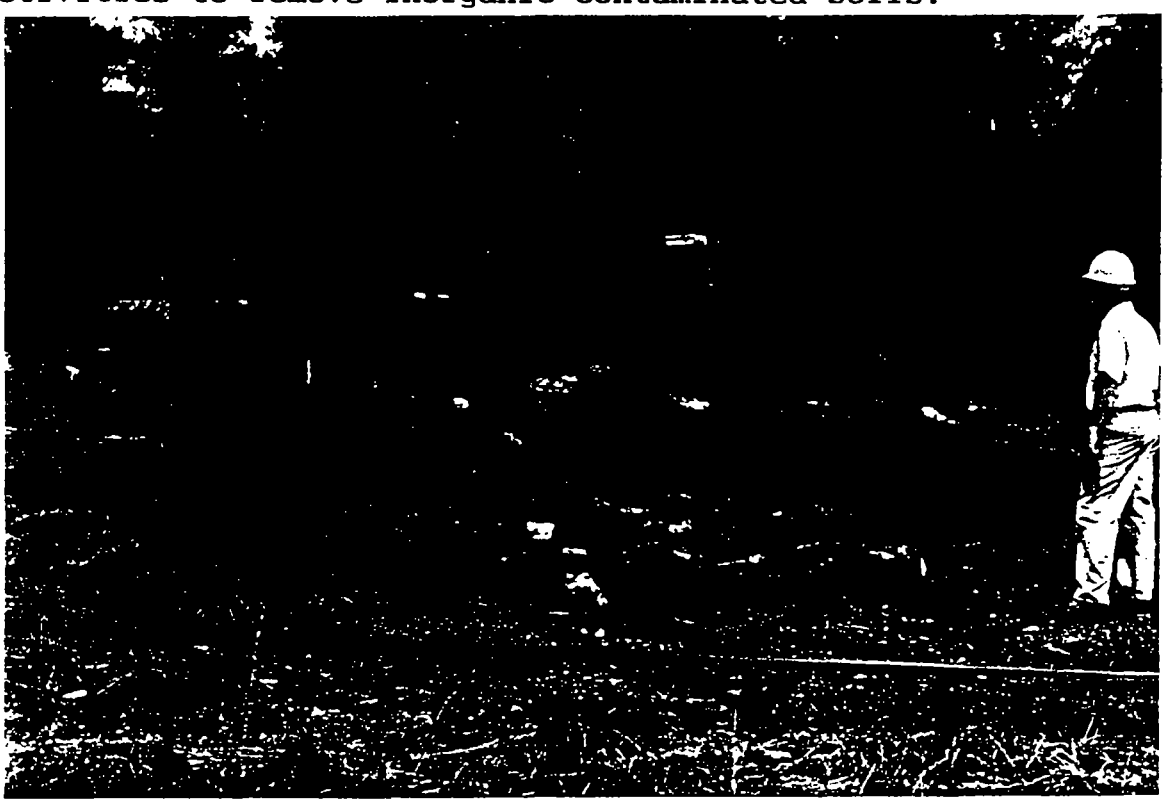
DATE: 7/31/91	FIGURE 2	HATCHER-SAYRE, INC. LEXINGTON, KY
DRAWN BY: PDH	AREAS INDICATING CONTAMINATION ABOVE THE SOIL ACTION LIMITS (SALs) - HEAVY METALS	
APPROVED BY: JDK		CLIENT NO.: 0064-001

Photograph No. 1 Date: September 2, 1992
Location: Howe Valley Landfill, Hardin County, Kentucky
Description: View of Area 7D as excavation activities commence.

Photograph No. 2 Date: September 2, 1992
Location: Howe Valley Landfill, Hardin County, Kentucky
Description: View of Area 7D as excavation nears completion.



Photograph No. 3 Date: September 3, 1992
Location: Howe Valley Landfill, Hardin County, Kentucky
Description: View of Area 1.5D prior to initiating excavation activities to remove inorganic contaminated soils.



Photograph No. 4 Date: September 3, 1992
Location: Howe Valley Landfill, Hardin County, Kentucky
Description: View of Area 1.5D following excavation of inorganic contaminated soils.

Photograph No. 5 Date: September 3, 1992
Location: Howe Valley Landfill, Hardin County, Kentucky
Description: Preparation of stockpile area to stage contaminated soils consisting of plastic overlain with 12 inches of sand.

Photograph No. 6 Date: September 3, 1992
Location: Howe Valley Landfill, Hardin County, Kentucky
Description: View of stockpiled contaminated soil. Soil to be transported off-site for disposal.

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February 10, 1993

Ms. Felicia Barnett
Remedial Project Manager
U.S. Environmental Protection Agency
345 Courtland Street, N.E.
Atlanta, Georgia 30365

WESTON W.O. No. 04400-017-091

RE: Field Oversight Summary Report
Howe Valley Landfill Site, Howe Valley, Hardin County, Kentucky
Contract No. 68-W9-0057
Work Assignment No. 17-4XN8
Document Control No. 4400-17-ACRL

Dear Ms. Barnett:

Enclosed is WESTON's Field Oversight Report for February 4-5, 1993 at the Howe Valley Landfill Site. This report includes a status of the site activities performed by the PRP contractor, Hatcher-Sayre, Inc, and WESTON's oversight activities in accordance with Task 5 of the oversight work plan. Activities performed at the site this week involved the startup of the water treatment system. Photographic documentation of this activity is included with this report.

Please call me at (404) 448-0644 if you have any questions.

Sincerely,

ROY F. WESTON, INC.

Ralph P. McKeen, P.E.
Work Assignment Manager

RPM/cmf
Enclosure

cc: Annie Godfrey, EPA, Region IV
Randy Ferguson, WESTON

ATTACHMENT

Contract No. 68-W9-0057
Work Assignment No. 17-4XN8
Document Control No. 4400-17-ACRL

Situation

This report contains activities performed at the Howe Valley Landfill Site on February 4-5, 1993. Present on-site were the following:

Name	Company	Role
Ralph P. McKeen	Roy F. Weston, Inc.	EPA Oversight
Paul Weaver	Hatcher-Sayre, Inc.	Site Manager
Tim Young	Private	Private Consultant

This phase of field activities included the startup of the water treatment system to treat contaminated water which accumulated in the excavation areas while performing the Pilot Treatability Study. The water will be treated with a Granular Activated Carbon (GAC) unit in accordance with the approved Final RD/RA Water Treatment Work Plan prepared by Hatcher-Sayre, Inc., January 8, 1993. WESTON's oversight objective was to verify the implementation of this treatment system according to the work plan and collect split water samples from Boutwell Spring as well as effluent from the treatment system.

Activity Summary

February 4, 1993

The initial activity involved collecting a water sample from Boutwell Spring. WESTON arranged to meet Hatcher-Sayre's Paul Weaver and their consultant Tim Young at the Howe Valley Elementary School. At 1630 hours, we arrived at the Boutwell Farm and checked with the caretaker of the farm to ensure that the electric fence surrounding the area was disconnected. The spring water was flowing and clear (Photograph No.1). WESTON and Hatcher-Sayre obtained samples from the same vicinity of the ponded area around the spring. WESTON collected 3-40ml glass vials for volatile organic analysis and

labeled the sample **BS-1** while Hatcher-Sayre collected 2-40ml glass vials. The samples were packed on ice until the effluent sample was obtained.

The treatment system was operated to treat the water contained in the 2,500-gallon polyethylene tank. Hatcher-Sayre was currently cleaning this tank to be used as a holding tank in the treatment system per the approved work plan.

February 5, 1992

Hatcher-Sayre completed cleaning the 2,500-gallon tank and hook-up of the pumps for the treatment system. The top hatch on the GAC unit leaked when pressurized and required changing. Several other minor leaks in the piping network required attention as well. Water treatment commenced through the system at approximately 1330 hours. At 1535 hours WESTON and Hatcher-Sayre collected treated effluent samples from a sample port located halfway between the 2,500-gallon tank and the discharge pond (Photograph No. 8). This port was selected due to the presence of electric generator exhaust vapors at the port next to the tank and GAC unit. WESTON collected 3-40ml glass vials for volatile organic analysis and labeled the sample **EF-1** while Hatcher-Sayre Collected 2-40ml glass vials. This sample and the Boutwell Spring sample were shipped to the EPA Environmental Services Division laboratory in Athens, Georgia for volatile organic analysis.

While on-site, WESTON's Ralph McKeen observed the entire site to document the status of all site activities. The two drum excavation areas remain open but lined with 6 mil visqueen (Photograph No. 4). The excavated drums remain staged and covered with visqueen (Photograph No. 2). Three aeration areas are now prepared for continued roto-tilling operations. Organic contaminated soils have been stockpiled adjacent to the aeration areas.

WESTON departed the site at 1700 hours. The water treatment system continued to operate at 58 gallons per minute (gpm) and approximately 9000 gallons had been treated as recorded on the totalizing flow meter.

Work Plan Deviations

This phase of field activities was performed in accordance with the approved work plan and the treatment system configured as shown on Figure 3 of the plan. The only deviation observed during the operation of the system was the treatment rate. The work plan stated that the pump was sized to obtain a rate of 40 gpm while the actual rate was 58 gpm.

WESTON noted this difference and discussed this with the site manager, Paul Weaver. The maximum specified flow rate for this GAC unit is 50 gpm. WESTON contacted Hatcher-Sayre's Jim Knauss on Monday, 2/8/93 and was informed that a ball valve was placed in the system line to restrict the flow rate below the 50 gpm rate.

Another observation worth noting is the collection pond capacity. The berms do not have the structural integrity to contain water if it is completely filled. This was apparent when leaking was observed when only 9000 gallons had been pumped to the pond. Although infiltration is the intended disposition, it will not occur at the rate in which treated water is discharged to this pond. As discussed with Consultant Tim Young, it may be necessary to run additional discharge line upgradient of this pond for discharge as it nears capacity. The addition line could be slotted pipe to disperse the water over a larger area enhancing the infiltration process.

Future Planned Activities

Hatcher-Sayre plans to make final disposal arrangement for the inorganic contaminated soil stock piles as well as the staged drums. Disposal arrangements are being coordinated with Chem Waste Management. Clean debris will be transported to the Outer Loop sanitary landfill in Jefferson County which is operated by Waste Management, Inc.

Upon completion of the water treatment activities, the dye trace study will be initiated. This will be followed by continued organic liquid investigations.

Photograph No. 1 **Date:** February 4, 1993
Location: Howe Valley Landfill, Howe Valley, Hardin County, Kentucky
Description: View of Boutwell Spring prior to obtaining water sample.

Photograph No. 2 **Date:** February 5, 1993
Location: Howe Valley Landfill, Howe Valley, Hardin County, Kentucky
Description: Recovered drums remain overpacked and covered awaiting final disposal arrangments.

Photograph No. 3 **Date:** February 5, 1993
Location: Howe Valley Landfill, Howe Valley, Hardin County, Kentucky
Description: Water in the excavation pit to be removed and treated.

Photograph No. 4 **Date:** February 5, 1993
Location: Howe Valley Landfill, Howe Valley, Hardin County, Kentucky
Description: One of the two drum removal location areas.

Photograph No. 5 **Date:** February 5, 1993
Location: Howe Valley Landfil, Howe Valley, Hardin County, Kentucky
Description: View of the granular activated carbon (GAC) unit, pump and prefilter. The GAC unit has been insulated and wrapped to prevent freezing.

Photograph No. 6 **Date:** February 5, 1993
Location: Howe Valley Landfill, Howe Valley, Hardin County, Kentucky
Description: Effluent line from GAC unit discharges into the 2500 gallon poly tank and subsequently pumped to the collection pond.

Photograph No. 7 **Date:** February 5, 1993
Location: Howe Valley Landfill, Howe Valley, Hardin County, Kentucky
Description: View of the collection pond receiving treated water.

Photograph No. 8 **Date:** February 5, 1993
Location: Howe Valley Landfill, Howe Valley, Hardin County, Kentucky
Description: Sampling port located halfway between treatment system and the collection pond.

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May 5, 1993

Ms. Felicia Barnett
Remedial Project Manager
U.S. Environmental Protection Agency
345 Courtland Street, N.E.
Atlanta, Georgia 30365

WESTON W.O. No. 04400-017-091

RE: Field Oversight Summary Report
Howe Valley Landfill Site, Howe Valley, Hardin County, Kentucky
Contract No. 68-W9-0057
Work Assignment No. 17-4XN8
Document Control No. 4400-17-ACVX

Dear Ms. Barnett:

Enclosed is WESTON's Field Oversight Report for April 29-30, 1993, at the Howe Valley Landfill Site. This report includes the status of the site activities performed by the PRP contractor, Hatcher-Sayre, Inc, and WESTON's oversight activities in accordance with Task 5 of the oversight work plan. Activities performed at the site this week involved the continuation of the organic liquid investigation. Photographic documentation of this activity was performed and is included with this report.

Please call me at (404) 448-0644 if you have any questions.

Sincerely,

ROY F. WESTON, INC.

Ralph P. McKeen, P.E.
Work Assignment Manager

RPM/cmf
Enclosure

cc: Rob Stern, EPA, Region IV
Randy Ferguson, WESTON

B:H1\HOWEVAL\LTRRM009.CMF

ATTACHMENT

Contract No. 68-W9-0057
Work Assignment No. 17-4XN8
Document Control No. 4400-17-ACVX

Situation

This report contains activities performed at the Howe Valley Landfill Site on April 29-30, 1993. Present on-site were the following:

Name	Company	Role
Ralph P. McKeen	Roy F. Weston, Inc.	EPA Oversight
Kevin Durham	Hatcher-Sayre, Inc.	Technician/Air Monitoring
Tim Young	Private Consultant	Site Manager
Raymond Savage	Taurus, Inc.	Cleanup Contractor

This phase of field activities included investigating sludge and other solid material associated with the organic liquid beneath the upper layer of bedrock. While attempting to perform the dye trace study by injecting dye into the on-site swallet, additional organic liquid was discovered. This organic liquid appeared to be originating from under the top layer of bedrock. When this layer was pulled back, it was discovered that prominent solution features were located on the underside of the top bedrock layer. Within these solution features was evidence of the organic liquid and contaminated soils. Therefore, rather than continuing with the organic liquid investigation with probes as described in the Organic Liquid Investigation Work Plan, it was decided to remove the upper bedrock layer to expose the liquid for removal.

Activity Summary

April 29, 1993

WESTON's Ralph McKeen arrived on site at 1130 hours and met with the Site Manager, Tim Young. The current conditions of the site include:

- The majority of the water in the pit had been treated. A low profile air stripper has been added to the water treatment system to increase the life of the carbon. It has been installed just before the GAC unit (Photograph #6). To date approximately 250,000 gallons of water have been treated. Hatcher-Sayre's analytical results of the treated effluent collected during start-up on February 5, 1993 revealed that the treatment system was functioning properly with no observed contaminants of concern. EPA split sample results are pending.

- The staged drums from the buried drum removal activities in November 1992 have been transported to PetroChem in Midland, Michigan, for disposal.

- The stockpile of inorganic contaminated soils remains on site (Photograph # 5). Hatcher-Sayre continues to pursue final disposal arrangements with Chem Waste Management.

- Contaminated soil removed from the central excavation area remains stockpiled near the three aeration areas.

The cleanup contractor, Taurus, Inc. placed an excavator in the pit near the swallet and commenced to removing the top layer of bedrock. Stained soils and some free liquid was observed in these solution cavities. This bed appears to be approximately two feet thick near the swallet and increasing in thickness upgradient. When sections of this upper layer of bedrock are turned over by the excavator, the solution features have the appearance of termite damage to wood. (Photograph #3). As the sections of bedrock are removed, the rock and contaminated soil are segregated into separate piles.

April 30, 1993

Overnight, 0.13 inches of rain were recorded from the gage on site. This small amount of precipitation did not hamper excavation activities. The organic liquid investigation continued by removing the top layer of bedrock. As stated earlier, this layer increases in thickness in the upgradient direction (north). The excavator currently being used began having difficulty breaking and removing the larger sections of rock; therefore, Taurus, Inc. is preparing to replace this unit with a larger excavator. It may also be necessary to utilize a hammer extension to break up the larger rock sections for removal. This is not a preferred option since the hammer action may cause fractures in the lower bedrock layer providing another conduit for the organic liquid to migrate.

Hatcher-Sayre conducted air monitoring with an HNU trace organic vapor analyzer during the excavation activities. Readings were observed to be 5 to 6 units above background in the breathing zone while reading as high as 140 units were recorded at the surface of the liquid and contaminated soils. The excavator operator experienced breakthrough on the organic vapor cartridges in Level C and promptly upgraded to Level B personal protective equipment. The vapor appeared to be concentrating around the excavator since HNU readings in the breathing zone 30 feet away remained at 5 units above background.

Hatcher-Sayre collected a sample of the liquid observed when a large section of bedrock was removed. An unknown red particulate material was observed floating in the liquid. One 8-ounce and three 40 ml vials of the liquid were collected to be analyzed for the full HSL compounds.

WESTON departed the site at 1200 hours. Excavation of the upper layer of bedrock will continue upgradient until it is confirmed that no other sources of organic liquid are present.

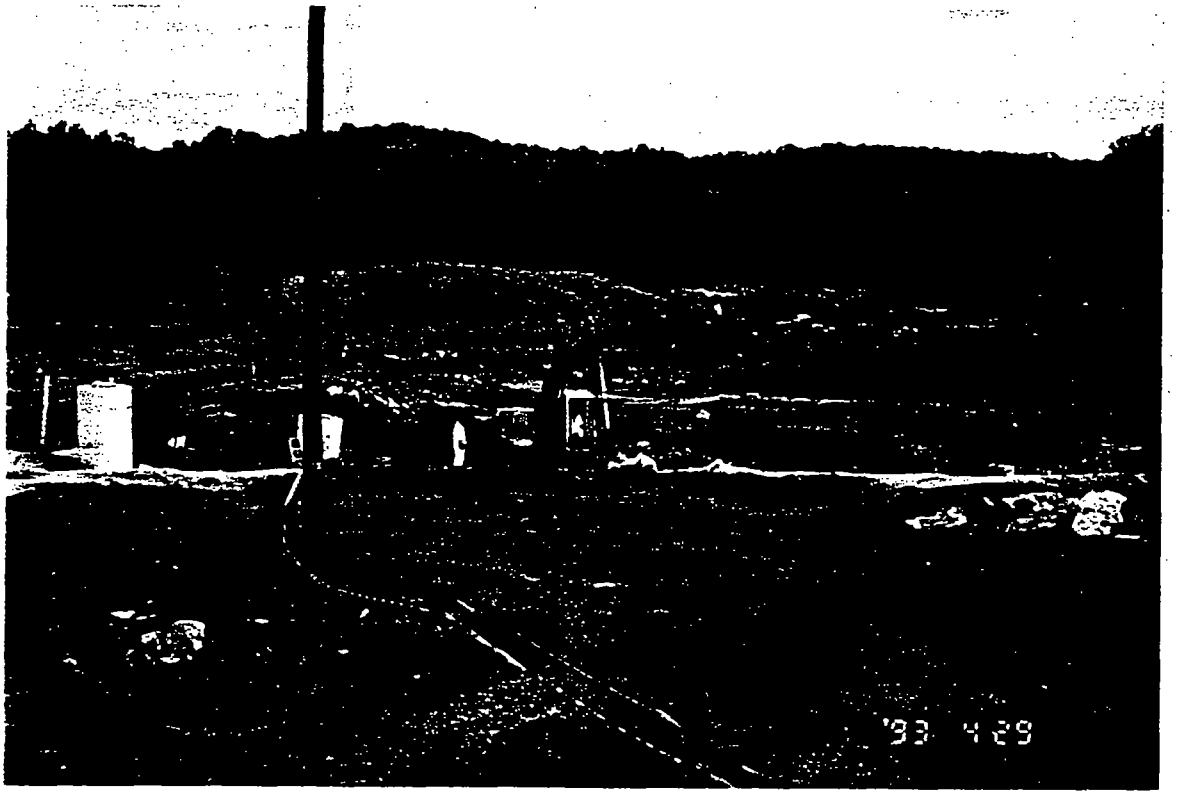
Work Plan Deviations

This phase of field activities is being performed under the verbal approval of EPA RPM Barnett. The original plan to investigate the organic liquids was to collect samples with split spoon samplers or Shelby tube devices within the surface depression features. Due to the discovery of free solution features on the underside of this bedrock layer, it was deemed more appropriate to removed this layer to expose and remove any more free liquids and contaminated soils.

Future Planned Activities

Hatcher-Sayre plans to make final disposal arrangements for the inorganic-contaminated soil. Disposal arrangements are being coordinated with Chem Waste Management.

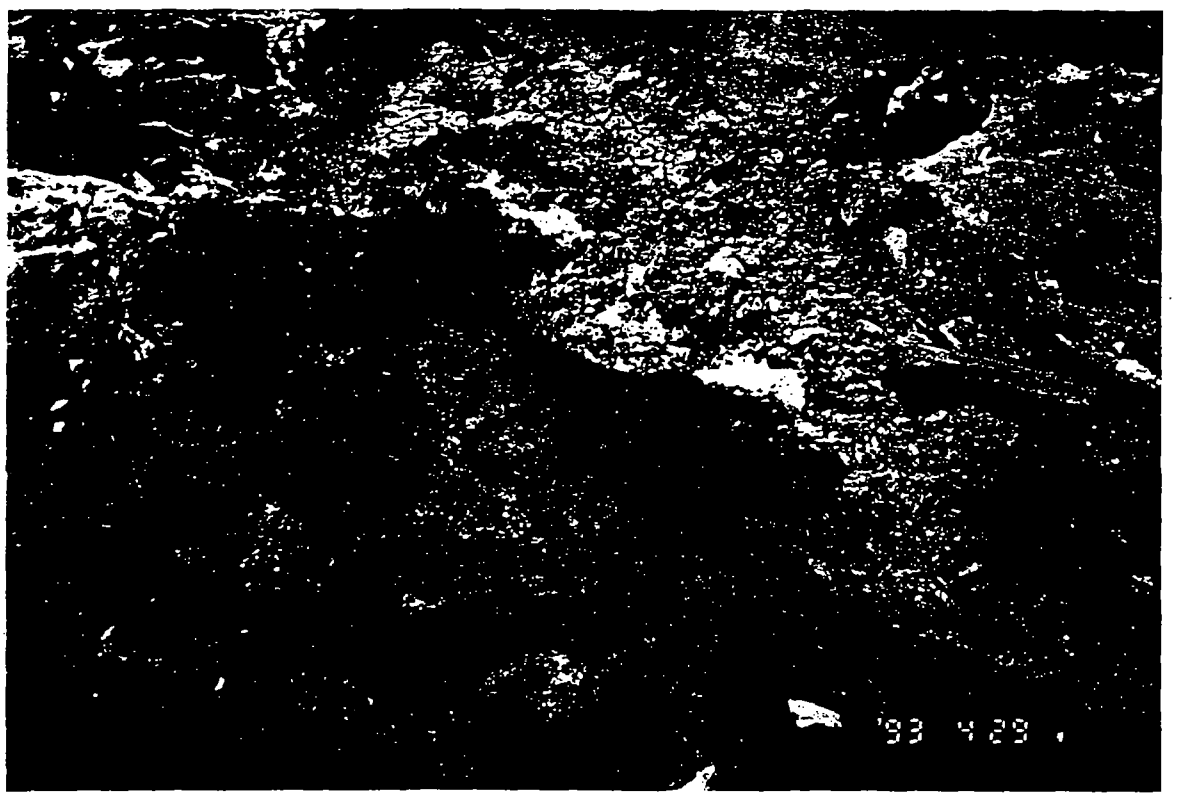
Upon completion of the organic liquid investigation and removal activities, the dye trace study will be attempted into the swallet according to the Dye Trace Study Work Plan dated 1/1/93. Subsequently, aeration of the stockpiled soil via roto-tilling will resume. A question at this point will be whether the soil currently being removed with the organic liquids can be treated in the same manner. The analytical results of the liquid samples obtained this week will determine the identity and concentration of contaminants.



Photograph No. 1 **Date:** April 29, 1993
Location: Howe Valley Landfill, Howe Valley, Hardin County, Kentucky
Description: PRP Contractor, Hatcher- Sayre, Inc., excavating to locate and remove organic liquids in the central exavation area. Large soil pile in background has been staged awaiting aeration treatment via roto-tilling.

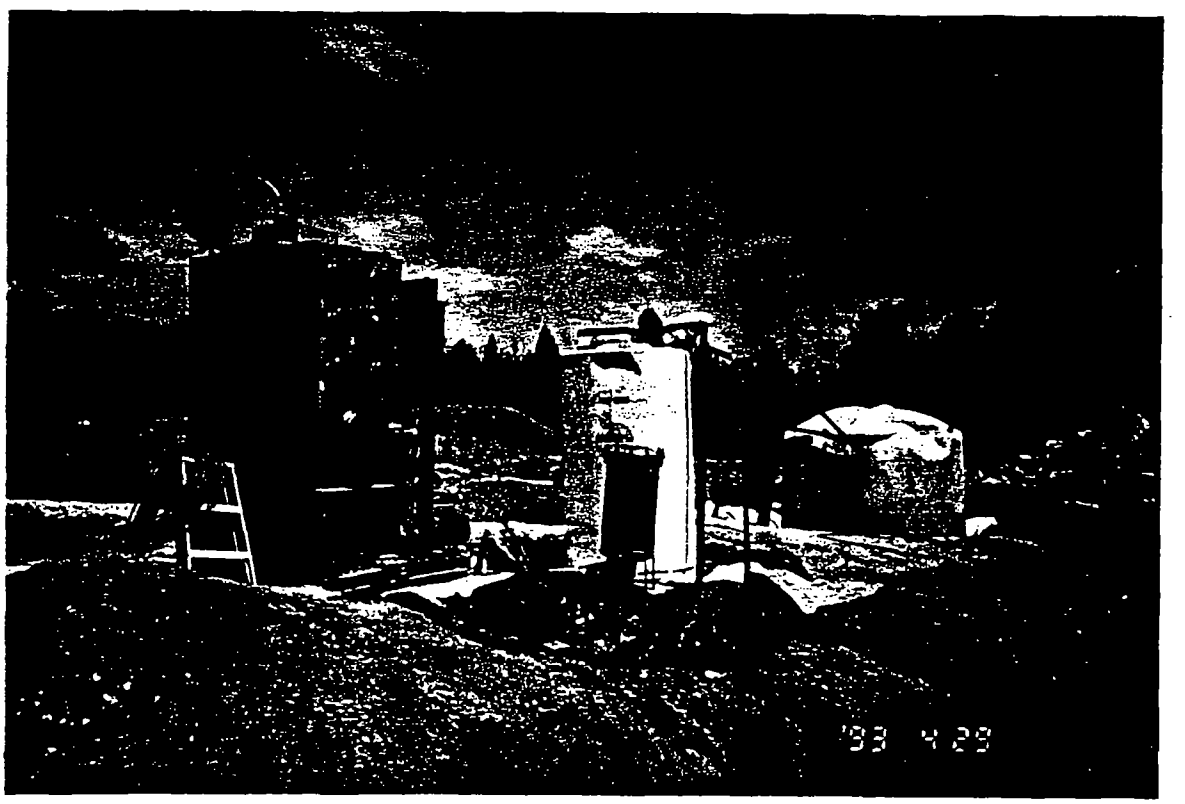
Photograph No. 2 **Date:** April 30, 1993
Location: Howe Valley Landfill, Howe Valley, Hardin County, Kentucky
Description: Sections of the upper layer of bedrock being removed to expose additional organic liquids.

Photograph No. 3 **Date:** April 29, 1993
Location: Howe Valley Landfill, Howe Valley, Hardin County, Kentucky
Description: The underside of the upper bedrock layer which was turn over showing the solution features.



Photograph No. 4 **Date:** April 29, 1993
Location: Howe Valley Landfill, Howe Valley, Hardin County, Kentucky
Description: Free liquids exposed when upper layer of bedrock is removed.

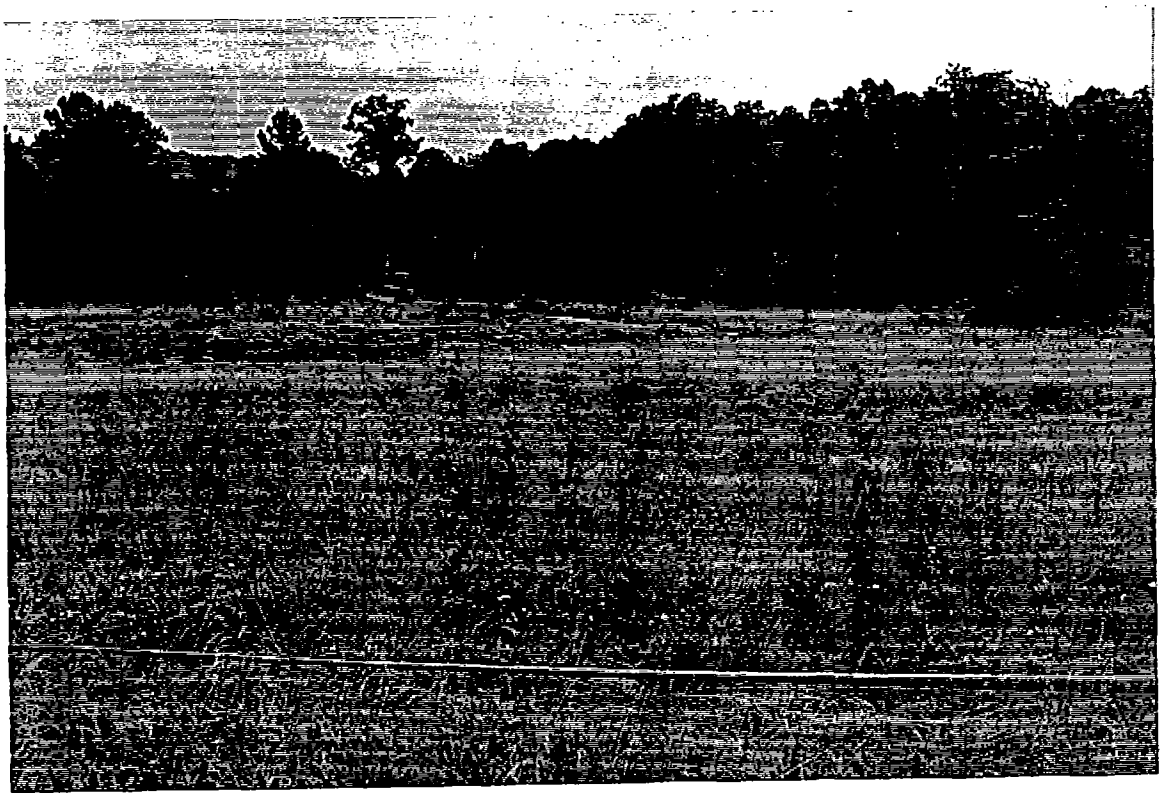
Photograph No. 5 **Date:** April 30, 1993
Location: Howe Valley Landfil, Howe Valley, Hardin County, Kentucky
Description: View of the inorganic contaminated soil pile recently recovered with visqueen.



Photograph No. 6 **Date:** April 29, 1993
Location: Howe Valley Landfill, Howe Valley, Hardin County, Kentucky
Description: Current water treatment system. A low profile air stripper (left) has been added ahead of the activated carbon unit.

APPENDIX B

PHOTOGRAPHIC DOCUMENTATION



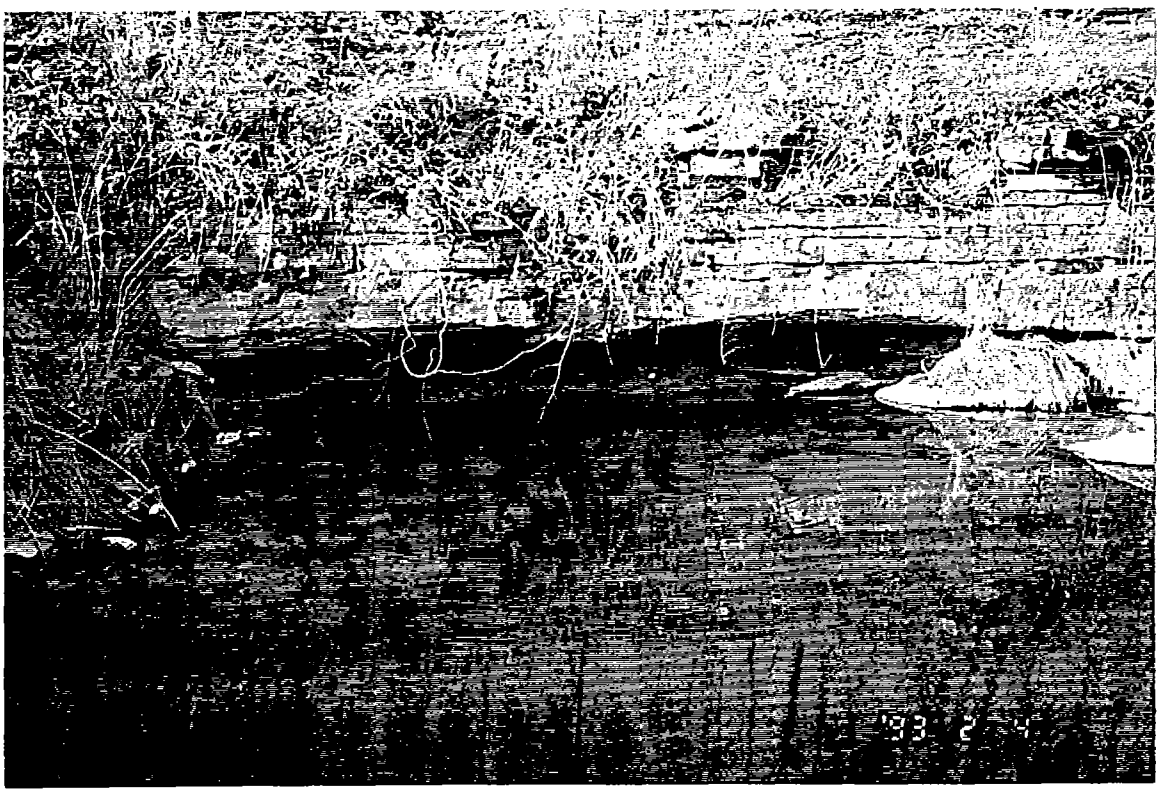
Photograph No. 1 **Date:** August 31, 1992
Location: Howe Valley Landfill, Howe Valley, Hardin County, Kentucky
Description: View of the central portion of the site prior to the start of remedial actions. PRP contractor, Shield Environmental Associates, Inc. (formerly Hatcher-Sayre, Inc.) cordoned off the areas to be excavated.

Photograph No. 2 **Date:** August 31, 1992
Location: Howe Valley, Howe Valley, Hardin County, Kentucky
Description: View of the north section of the site designated as Area 1.5D where soils contaminated with inorganics were excavated.

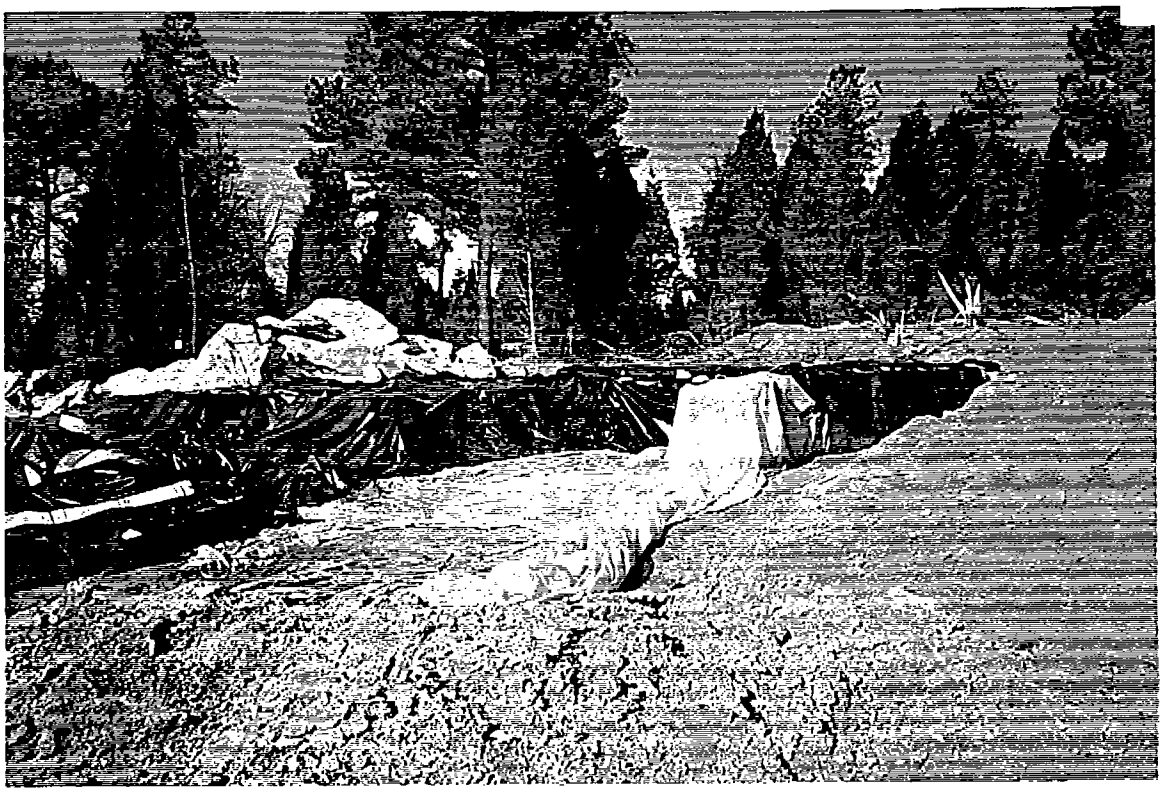
Photograph No. 3 **Date:** September 2, 1992
Location: Howe Valley Landfill, Howe Valley, Hardin County, Kentucky
Description: View of Area 7D being excavated to remove soils containing inorganic contamination.

Photograph No. 4 **Date:** December 9, 1992
Location: Howe Valley Landfill, Howe Valley, Hardin County, Kentucky
Description: Staging area for inorganic contaminated soils prepared with plastic and overlain with 12 inches of sand.

Photograph No. 5 **Date:** September 3, 1992
Location: Howe Valley Landfill, Howe Valley, Hardin County, Kentucky
Description: Inorganic contaminated soil being placed on staging pad until off-site disposal arrangments are completed.



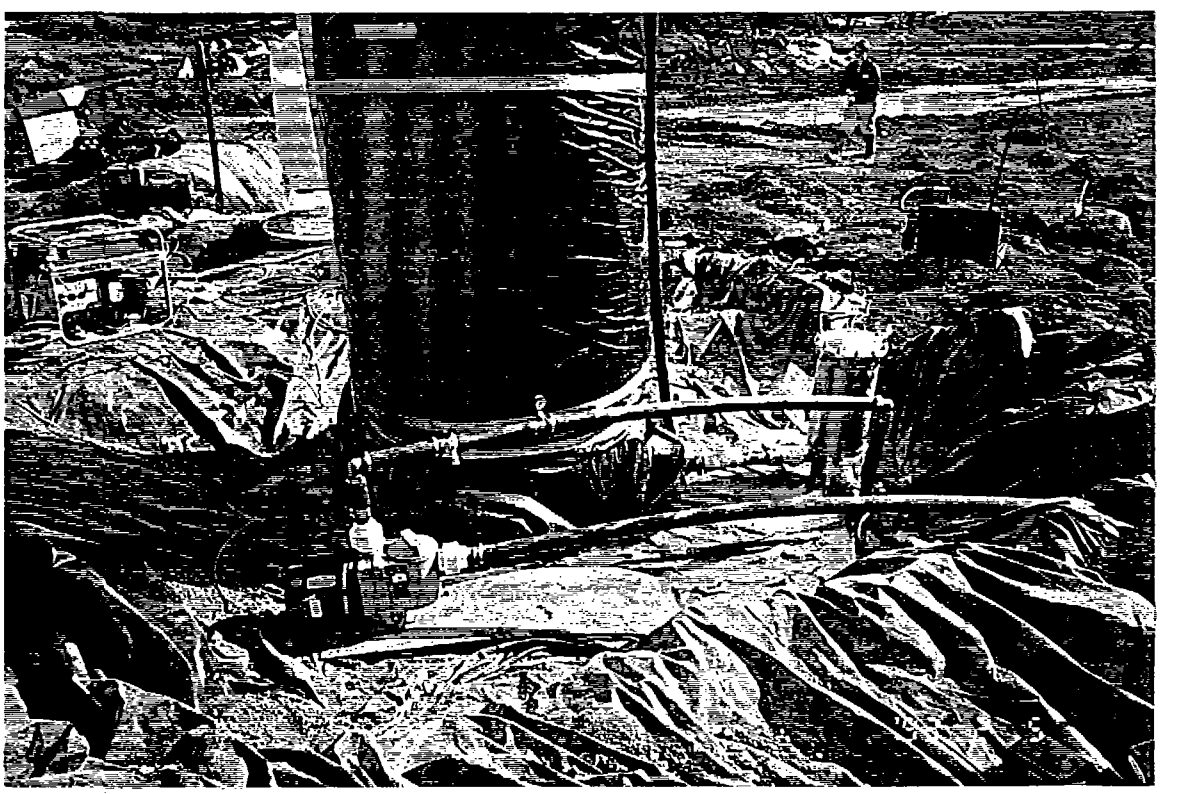
Photograph No. 6 **Date:** February 4, 1993
Location: Howe Valley Landfill, Howe Valley, Hardin County, Kentucky
Description: View of Boutwell Spring prior to obtaining a water sample for analysis.



Photograph No. 7 **Date:** February 5, 1993
Location: Howe Valley Landfill, Howe Valley, Hardin County, Kentucky
Description: Drums recoverd during the November 1992 buried drum removal action awaiting final disposal arrangements.

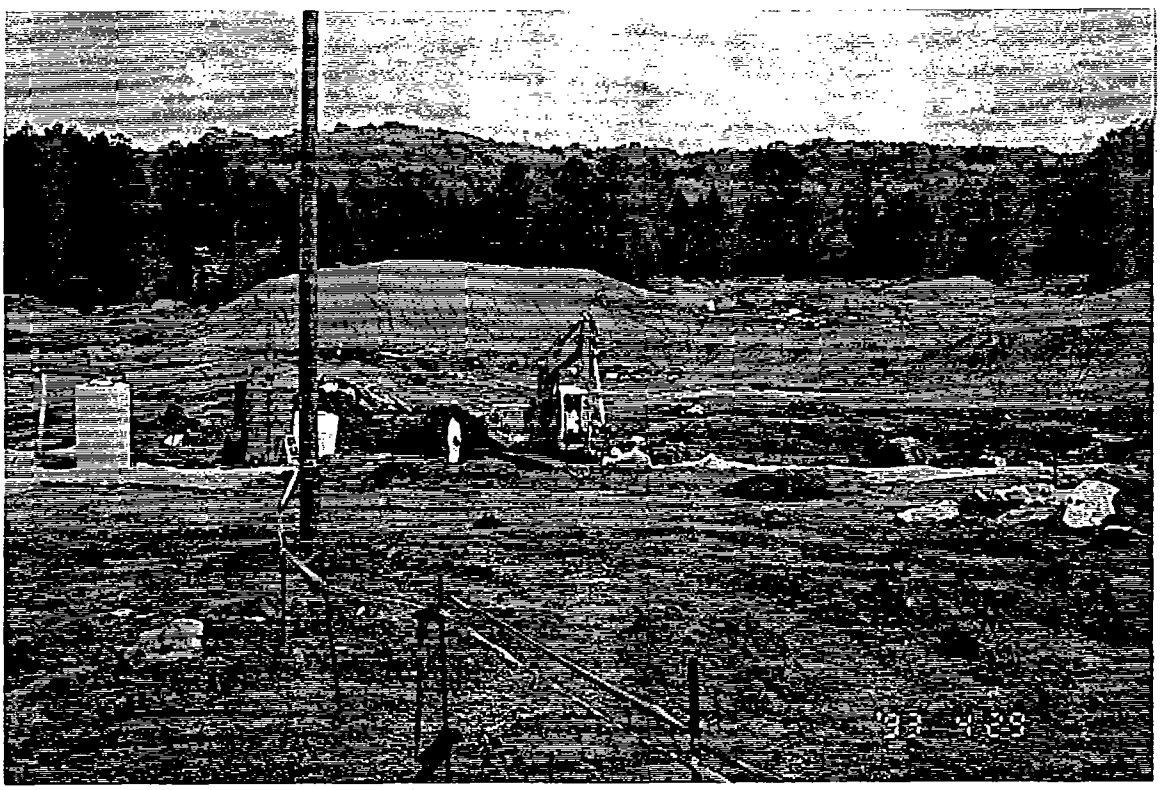
Photograph No. 8 **Date:** February 5, 1993
Location: Howe Valley Landfill, Howe Valley, Hardin County, Kentucky
Description: Water accumulated in the central excavation area being removed and treated.

Photograph No. 9 **Date:** February 5, 1993
Location: Howe Valley Landfill, Howe Valley, Hardin County, Kentucky
Description: One of the two drum excavation and removal locations.



Photograph No. 10 **Date:** February 5, 1993
Location: Howe Valley Landfill, Howe Valley, Hardin County, Kentucky
Description: View of the granular activated carbon (GAC) unit, pump, and prefilter. The GAC unit was insulated and wrapped to prevent freezing.

Photograph No. 13 **Date:** February 5, 1993
Location: Howe Valley Landfill, Howe Valley, Hardin County, Kentucky
Description: A sampling port was installed midway between the water treatment system and collection pond for sampling and analysis of effluent.

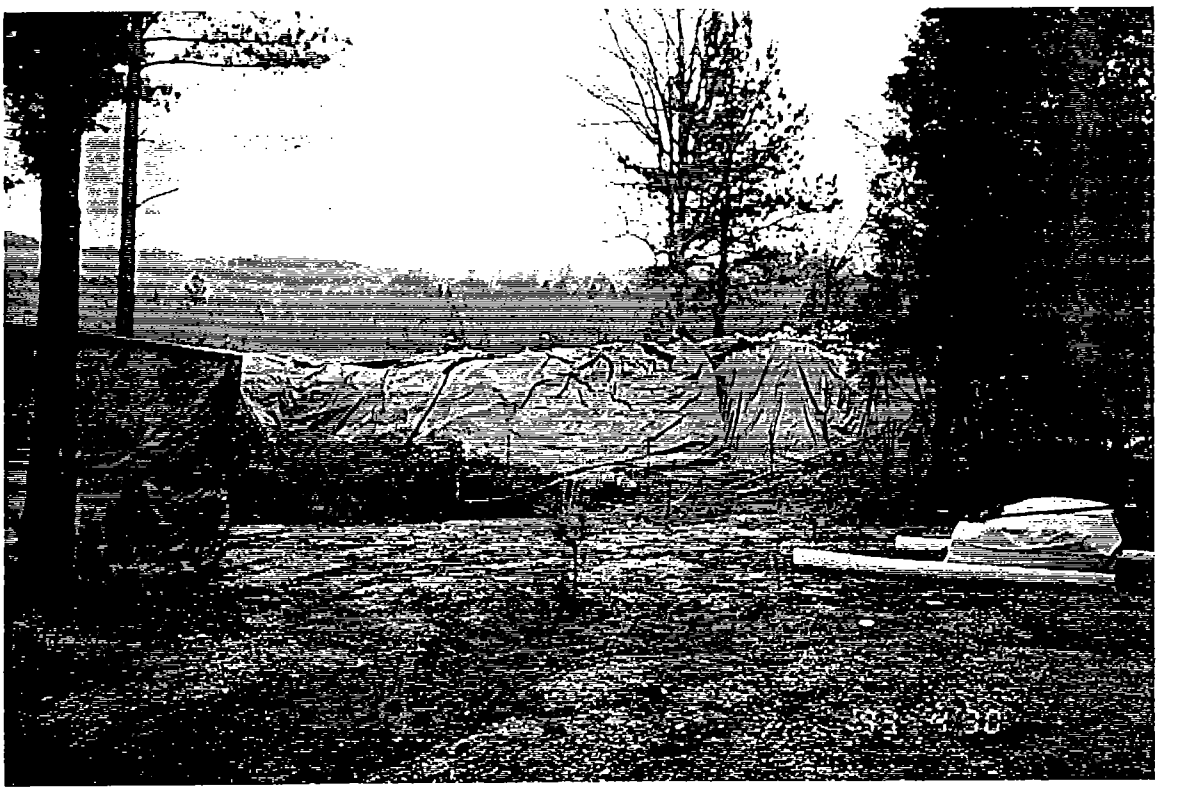


Photograph No. 14 **Date:** April 29, 1993
Location: Howe Valley Landfill, Howe Valley, Hardin County, Kentucky
Description: PRP Contractor, Shield Environmental, excavating to locate and remove organic liquids in the central excavation area. Large soil pile in background has been staged awaiting aeration treatment via roto-tilling.

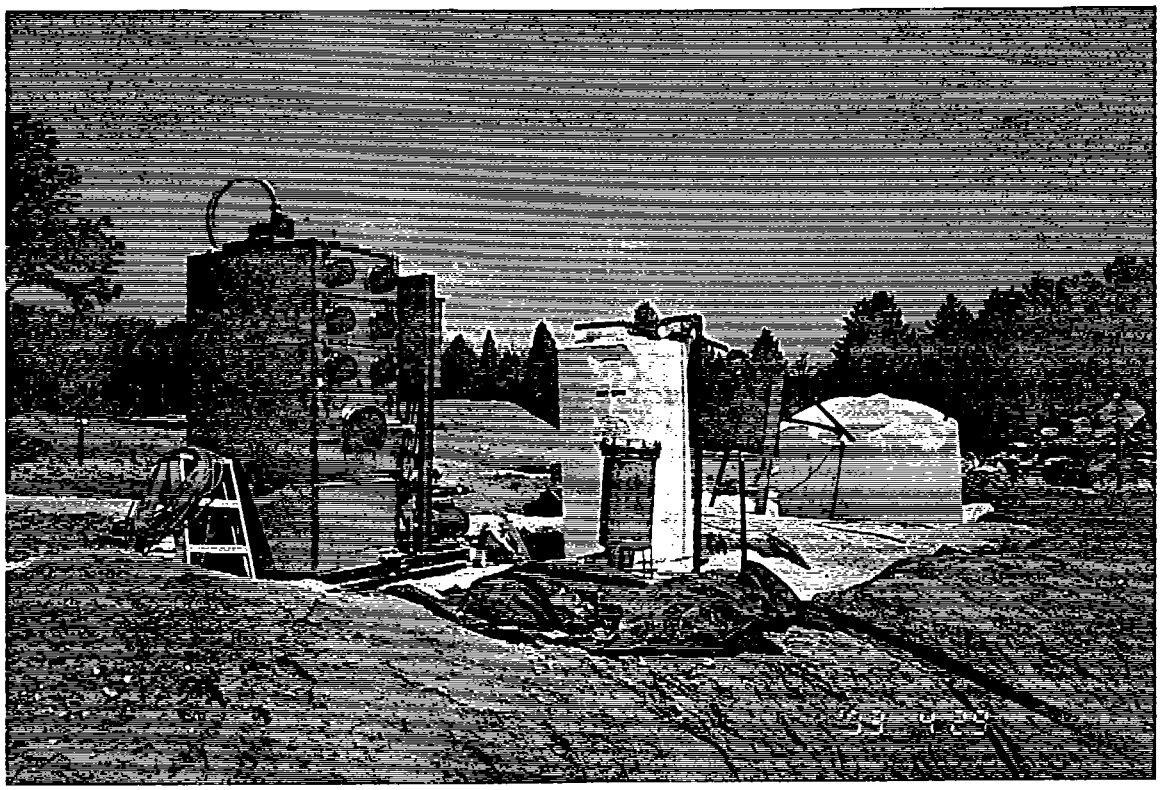
Photograph No. 15 **Date:** April 30, 1993
Location: Howe Valley Landfill, Howe Valley, Hardin County, Kentucky
Description: Sections of the upper bedrock layer removed to expose additional free organic liquids and contaminated soil.

Photograph No. 16 **Date:** April 29, 1993
Location: Howe Valley Landfill, Howe Valley, Hardin County, Kentucky
Description: The underside of the bedrock layer which was turned over showing the solution features and cavities which contained free organic liquids and contaminated sediment

Photograph No. 17 **Date:** April 29, 1993
Location: Howe Valley Landfill, Howe Valley, Hardin County, Kentucky
Description: Free liquids exposed when upper layer of bedrock was removed.



Photograph No. 18 **Date:** April 30, 1993
Location: Howe Valley Landfill, Howe Valley, Hardin County, Kentucky
Description: View of the inorganic contaminated soil pile recently re-covered with visqueen awaiting final disposal.



Photograph No. 19 **Date:** April 29, 1993
Location: Howe Valley Landfill, Howe Valley, Hardin County, Kentucky
Description: View of water treatment system upgraded to include a low profile air stripper (left) for removal of organic contaminants. GAC unit in center discharging to holding tank.

Photograph No. 20 **Date:** July 15, 1993
Location: Howe Valley Landfill, Howe Valley, Hardin County, Kentucky
Description: Removal of upper limestone bedrock to expose and remove additional organic liquids and stained soils.

Photograph No. 21 **Date:** July 15, 1993
Location: Howe Valley Landfill, Howe Valley, Hardin County, Kentucky
Description: Aeration of organic contaminated soils using roto-tilling method powered by farm tractors.

Photograph No. 22 **Date:** July 15, 1993
Location: Howe Valley Landfill, Howe Valley, Hardin County, Kentucky
Description: Excavation into limestone bedrock with hoe-ram attachment to investigate additional organic contamination.

Photograph No. 23 **Date:** July 15, 1993
Location: Howe Valley Landfill, Howe Valley, Hardin County, Kentucky
Description: View of the support area located northwest of the central excavation area.

Photograph No. 24 **Date:** July 15, 1993
Location: Howe Valley Landfill, Howe Valley, Hardin County, Kentucky
Description: Overall view of the site looking south over the central excavation area. Limestone was segregated from the contaminated soils which were transported to aeration areas for treatment.